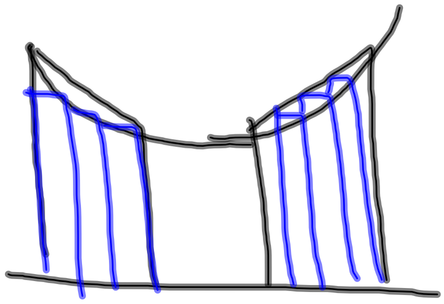
82. $r(t) = t^3 - 4t^2 + 6 \qquad 0 \le t \le 8$

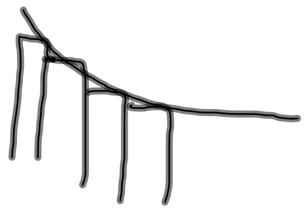
$\uparrow$ rate

$$\int_{a=1.572}^{b=3.514} r(t)\,dt \qquad \text{net change}$$

85. concave up, dec



RRAM underest



Apr 20-9:16 AM

86. $f'(x) = \sin(x^3) \qquad -1.8 < x < 1.8$

f - infl pts - where f'' changes sign

$f''(x) = 3x^2 \cos(x^3)$

87 $v = \cos(2-t^2) \qquad t=0 \quad x=3$

$x = ?$ when first $v=0$

$\cos(2-t^2) = 0 \qquad t = .6551$

final pos = initial pos + displacement

$$= 3 + \int_0^{.6551} \cos(2-t^2)\,dt \approx 2.816$$

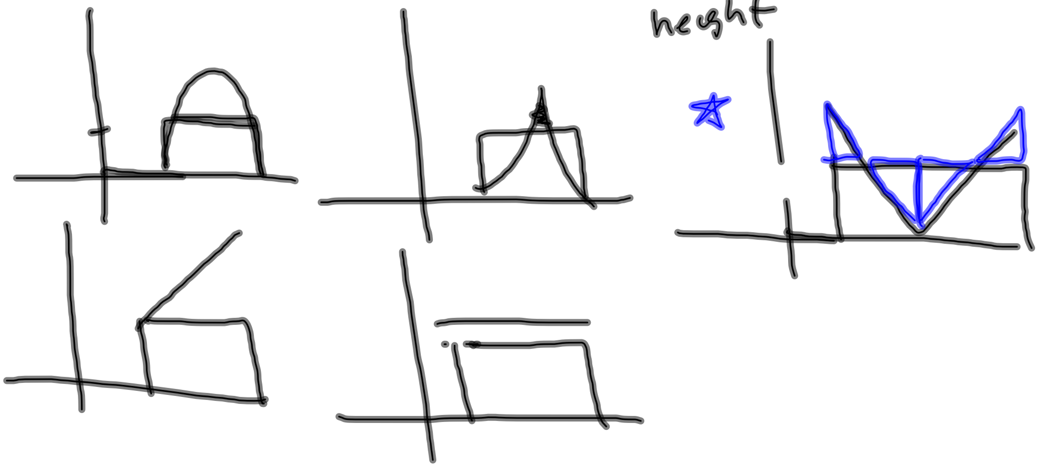
Apr 20-9:32 AM

88. $\frac{1}{4-2}\int_2^4 f(t)\,dt = 1$

net area rect.

$$\int_2^4 f(t)\,dt = 1 \cdot (4-2)$$

↑ height base



Apr 20-9:44 AM

91. $h = 24t + 24t^{3/2} - 16t^2$

h when v is max

$$h' = 24 + \tfrac{3}{2}\,24\,t^{\frac{1}{2}} - 32t$$

$$h'' = \tfrac{3}{4}\cdot 24\,t^{-\frac{1}{2}} - 32 = 0$$

$$h''' = 18\cdot\left(-\tfrac{1}{2}\right)t^{-3/2} < 0$$

$$\frac{18}{32\cancel{\sqrt{t}}} = \cancel{32}\sqrt{t}$$

$$\left(\frac{18}{32}\right)^2 = t$$

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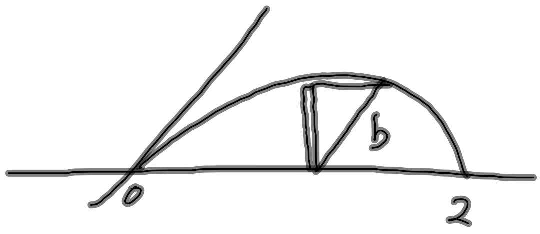
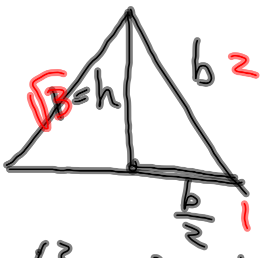
89. $y = 2x - x^2$, x axis



$$\int_0^2 \frac{1}{2} bh \, dx$$

$$\frac{1}{2}\int_0^2 (2x-x^2) \frac{\sqrt{3}}{2} (2x-x^2)$$



$b = y = 2x - x^2$

$h^2 = b^2 - \frac{b^2}{4} = \frac{3}{4} b^2$

$b^2 = h^2 + \left(\frac{b}{2}\right)^2$

$h = \sqrt{\frac{3}{4} b^2} = \frac{\sqrt{3}}{2} b$

Apr 20-9:56 AM

$f(x) = x + \ln x$

92

$f'(x) = 1 + \frac{1}{x}$

$\text{Solve}\left(f'(c) = 1 + \frac{1}{c} = \frac{(4+\ln 4) - (1+\ln 1)}{4-1}, c \right)$

$[1,4]$ inst. rate ave rate

Apr 20-10:01 AM

Review 26 more on Taylor

Remainder Thm (estimates error)

ϵ

$$f(x) \approx f(a) + f'(a)(x-a) + \frac{f''(a)(x-a)^2}{2!} \cdots \frac{f^{n}(a)(x-a)^n}{n!} \Big\} \epsilon$$

$$\epsilon \le \left| \frac{M(x-a)^{n+1}}{(n+1)!} \right|$$

M = max value of $f^{n+1}(x)$

Apr 20-10:05 AM

(mac series)

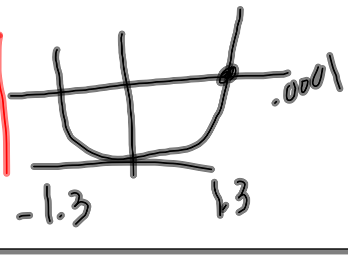
How many terms are required to approx $y = \sin x$ with an error of at most .0001 on $[-1.3, 1.3]$?

$$\sin x \approx x - \frac{x^3}{3!} + \frac{x^5}{5!} \cdots \frac{x^{2n+1}}{(2n+1)!}(-1)^{n+1}$$

next term $\left| \frac{x^{2n+3}}{(2n+3)!} \right| = .0001$

$\frac{1.3^5}{5!}$

$\left|\frac{x^5}{3!}\right|$



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$$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{3!} + \cdots$$

$$e^{2x} = 1 + 2x + \frac{(2x)^2}{2} + \frac{(2x)^3}{3!} \cdots$$

$$e^{x^2} = 1 + x^2 + \frac{x^4}{2} + \frac{x^6}{3!} \cdots$$

$3(x-\frac{1}{3})$

$$e^{(3x-1)} = 1 + (3x-1) + \frac{(3x-1)^2}{2} + \frac{(3x-1)^3}{3!} \cdots$$

not a mac series not centered on $x=0$

Is a taylor series with $a=\frac{1}{3}$

Apr 20-10:18 AM

$$f(x) = \sin\left(5x + \frac{\pi}{4}\right)$$

Apr 20-10:24 AM